

Message

From: Brasaemle, Karla [KBrasaemle@TechLawInc.com]
Sent: 3/21/2017 8:35:57 PM
To: d'Almeida, Carolyn K. [dAlmeida.Carolyn@epa.gov]; Dan Pope [DPope@css-inc.com]; Davis, Eva [Davis.Eva@epa.gov]; Henning, Loren [Henning.Loren@epa.gov]; Arvind Kutty [AKutty@TechLawInc.com]; Cosler, Doug [DCosler@TechLawInc.com]; Wayne Miller (Miller.Wayne@azdeq.gov) [Miller.Wayne@azdeq.gov]; Steve Willis [steve@uxopro.com]; Eleanor Jennings [ejennings@teci.pro]
Subject: RE: Slightly extended DFP Notes on the 3/17/2017 WAFB Conference Call and Path Forward

I have a similar issue Carolyn....

Karla Brasaemle, P.G.,
TechLaw, Inc.
415-762-0566

From: d'Almeida, Carolyn K. [mailto:dAlmeida.Carolyn@epa.gov]
Sent: Tuesday, March 21, 2017 1:20 PM
To: Dan Pope <DPope@css-inc.com>; Brasaemle, Karla <KBrasaemle@TechLawInc.com>; Davis, Eva <Davis.Eva@epa.gov>; Henning, Loren <Henning.Loren@epa.gov>; Kutty, Arvind <AKutty@TechLawInc.com>; Cosler, Doug <DCosler@TechLawInc.com>; Wayne Miller (Miller.Wayne@azdeq.gov) <Miller.Wayne@azdeq.gov>; Steve Willis <steve@uxopro.com>; Eleanor Jennings <ejennings@teci.pro>
Subject: RE: Slightly extended DFP Notes on the 3/17/2017 WAFB Conference Call and Path Forward

I had one comment from my review of the first version sent this morning. I had in my notes from the call on Friday that we had discussed effect of temperature on microbial population should also be tested in lab. I added a bullet to section below; can incorporate it into whichever master you are working with:

Path Forward

In order to go forward with EBR, the Agencies propose that a phased implementation approach be employed. The ultimate objective of using a phased implementation is to gather the information we need to ensure that EBR is being implemented in an optimal manner. From this information, we can establish milestones and criteria against which we can compare the full scale implementation to ensure that the remediation is proceeding in a manner and at a rate that will allow the remedial goals to be achieved in the estimated desired time frame. The "Decision Tree" states that the first step in implementing EBR would be "To establish location is ready for EBR injections". During this pumping/LNAPL removal and temperature stabilization step, Amec should provide well-documented case studies of specific sites where EBR, as Amec plans to do it, has actually remediated 100s of thousands of gallons of LNAPL/BTEX so as to reach 500-600 ug/L BTEX in groundwater, with no LNAPL remaining (or, at least, no LNAPL with COCs in the LNAPL). At the same time, laboratory experiments should be performed:

- a) In light of the inconclusive results from the field test on benzene degradation accompanying sulfate utilization, the first objective of the site specific testing should be demonstrating that the sulfate-reducing microbial consortia at this site is capable of degrading benzene, and if so, what conditions are necessary to maximize the degradation rate. If these laboratory experiments show that benzene degraders are not naturally present, it may be necessary to incorporate bioaugmentation into the EBR work plan.
- b) Laboratory experiments could determine if the existing microbial system is deficient in sulfate, and if so, the amount of sulfate needed to maximize degradation rates, and the amount of sulfate required for degradation of BTEX.

- c) As temperatures now vary widely across the site, lab experiments should also evaluate impact of temperature variability on microbial populations

These laboratory experiments must be performed utilizing soil samples from all four of the hydrologic zones: cobble zone (CZ), UWBZ, low permeability zone (LPZ), and LSZ.

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(415) 972-3150

"Because a waste is a terrible thing to mind..."

From: Dan Pope [<mailto:DPope@css-inc.com>]
Sent: Tuesday, March 21, 2017 12:52 PM
To: Brasaemle, Karla <KBrasaemle@TechLawInc.com>; Davis, Eva <Davis.Eva@epa.gov>; d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Henning, Loren <Henning.Loren@epa.gov>; Arvind Kutty <AKutty@TechLawInc.com>; Cosler, Doug <DCosler@TechLawInc.com>; Wayne Miller (Miller.Wayne@azdeq.gov) <Miller.Wayne@azdeq.gov>; Steve Willis <steve@uxopro.com>; Eleanor Jennings <ejennings@teci.pro>
Subject: RE: Slightly extended DFP Notes on the 3/17/2017 WAFB Conference Call and Path Forward

Version control? Yes! We have a lot of good stuff, but it's getting really scattered. I'm glad Eva volunteered to pull it all together.



From: Brasaemle, Karla [<mailto:KBrasaemle@TechLawInc.com>]
Sent: Tuesday, March 21, 2017 2:50 PM
To: Dan Pope; Davis, Eva; d'Almeida, Carolyn K.; Henning, Loren; Kutty, Arvind; Cosler, Doug; Wayne Miller (Miller.Wayne@azdeq.gov); Steve Willis; Eleanor Jennings
Subject: RE: Slightly extended DFP Notes on the 3/17/2017 WAFB Conference Call and Path Forward

OK, I'll use Dan's version for my edits. (We are starting to have a version control problemand Dan already made some of the changes I was considering)

Karla Brasaemle, P.G.,
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From: Dan Pope [<mailto:DPope@css-inc.com>]
Sent: Tuesday, March 21, 2017 12:44 PM
To: Davis, Eva <Davis.Eva@epa.gov>; d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Brasaemle, Karla <KBrasaemle@TechLawInc.com>; Henning, Loren <Henning.Loren@epa.gov>; Kutty, Arvind <AKutty@TechLawInc.com>; Cosler, Doug <DCosler@TechLawInc.com>; Wayne Miller (Miller.Wayne@azdeq.gov) <Miller.Wayne@azdeq.gov>; Steve Willis <steve@uxopro.com>; Eleanor Jennings <ejennings@teci.pro>
Subject: RE: Slightly extended DFP Notes on the 3/17/2017 WAFB Conference Call and Path Forward

My initial notes on Eva's draft document. Mainly I've added the specific references (it's getting hard to keep track of all the site documents!), and a few comments.

From: Davis, Eva [<mailto:Davis.Eva@epa.gov>]

Sent: Tuesday, March 21, 2017 9:41 AM

To: d'Almeida, Carolyn K.; Dan Pope; Brasaemle, Karla; Henning, Loren; Arvind Kutty; Cosler, Doug; Wayne Miller (Miller.Wayne@azdeq.gov); Steve Willis; Eleanor Jennings

Subject: FW: Slightly extended DFP Notes on the 3/17/2017 WAFB Conference Call and Path Forward

I've made the first attempt to put forward the reasons why the Agencies believe a phased implementation approach is necessary. I'm leaving the lab and field test descriptions to those who know more about it – please fill it in. I am purposely forwarding Dan's compilation of comments/concerns again, as he made some very good points about expected reactions from the AF/Amec, and we should try to head off those responses now by providing all the information he is suggesting.

From: Dan Pope [<mailto:DPope@css-inc.com>]

Sent: Monday, March 20, 2017 4:02 PM

To: d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Brasaemle, Karla <KBrasaemle@TechLawInc.com>; Davis, Eva <Davis.Eva@epa.gov>; Henning, Loren <Henning.Loren@epa.gov>; Arvind Kutty <AKutty@TechLawInc.com>; Cosler, Doug <DCosler@TechLawInc.com>; Wayne Miller (Miller.Wayne@azdeq.gov) <Miller.Wayne@azdeq.gov>

Cc: Eleanor Jennings <ejennings@teci.pro>; Steve Willis <steve@uxopro.com>

Subject: Slightly extended DFP Notes on the 3/17/2017 WAFB Conference Call and Path Forward

From: d'Almeida, Carolyn K. [<mailto:dAlmeida.Carolyn@epa.gov>]

Sent: Friday, March 17, 2017 5:55 PM

To: Brasaemle, Karla; Dan Pope; Davis, Eva; Henning, Loren; Arvind Kutty; Cosler, Doug; Wayne Miller (Miller.Wayne@azdeq.gov)

Cc: Eleanor Jennings; Steve Willis

Subject: RE: DFP Notes on the 3/17/2017 WAFB Conference Call

I added some afterthoughts in purple to consider how we use results of (ahem) phased implementation to inform the full scale

From: d'Almeida, Carolyn K. [<mailto:dAlmeida.Carolyn@epa.gov>]

Sent: Friday, March 17, 2017 3:10 PM

To: Dan Pope <DPope@css-inc.com>; Davis, Eva <Davis.Eva@epa.gov>; Brasaemle, Karla <KBrasaemle@TechLawInc.com>; Henning, Loren <Henning.Loren@epa.gov>; Kutty, Arvind <AKutty@TechLawInc.com>; Cosler, Doug <DCosler@TechLawInc.com>; Wayne Miller (Miller.Wayne@azdeq.gov) <Miller.Wayne@azdeq.gov>

Cc: Eleanor Jennings <ejennings@teci.pro>; Steve Willis <steve@uxopro.com>

Subject: RE: DFP Notes on the 3/17/2017 WAFB Conference Call

My notes from today:

- Adopt Phased Approach to implementation to collect site specific data to refine model, remedial timeframe estimate and performance criteria.
- Collect samples for microbial analysis to determine bacteria present, evaluate need for bioaugmentation.
- Perform lab testing to evaluate impact of temperature and sulfate loading rates on microbial population

- Incorporate phased implementation in specified areas differentiating between heavy LNAPL areas and dissolved phase areas in LSZ, UWBZ and CZ 3-6 months should be sufficient to evaluate degradation rate in dissolved phase areas, up to a year to evaluate degradation rate in heavy LNAPL areas Will need observation wells spaced within 6 months travel time of injection wells; bromide tracer useful for evaluating flow distribution around well.

Evaluate whether sulfate and tracer reach observation wells, then whether amendment is achieving biodegradation or not

- Update model to verify remedial timeframe, performance evaluation criteria and optimize full scale implementation
- Grid the full treatment area into optimization zones based upon existing conditions identified during characterization: Heavy LNAPL vs dissolved phase, temperature, microbial population, available sulfate, etc for optimized treatment, including possible bioaugmentation
- Install or designate observation wells within gridded optimization zones to evaluate remedy progress
- ADEQ working on alternative model

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Sent: Friday, March 17, 2017 2:35 PM
To: Davis, Eva <Davis.Eva@epa.gov>; d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Brasaemle, Karla <KBrasaemle@TechLawInc.com>; Henning, Loren <Henning.Loren@epa.gov>; Arvind Kutty <AKutty@TechLawInc.com>; Cosler, Doug <DCosler@TechLawInc.com>; Wayne Miller <Miller.Wayne@azdeg.gov> <Miller.Wayne@azdeg.gov>
Cc: Eleanor Jennings <ejennings@teci.pro>; Steve Willis <steve@uxopro.com>
Subject: DFP Notes on the 3/17/2017 WAFB Conference Call

DFP Notes on the Friday March 17, 2017 WAFB Conference Call:

Loren has said that **performance criteria** are to be emphasized.

Why are regulators proposing a phased implementation?

- Site conditions have changed from those contemplated in the ROD for EBR/MNA
- EBR/MNA has not been tested and proven effective at a site of this size, complexity, and source mass – particularly in terms of the timeframe contemplated

- Therefore, a phased implementation (initially limited in terms of the volume of the subsurface applied) is indicated for proof of concept, and to provide data for EBR design and performance criteria.

Modeling

AF should provide a predictive modeling approach suited to determining timeframes for EBR and MNA to reach the respective goals for those remedy approaches. This modeling will include items related to performance criteria (timelines, triggers, COC concentrations, etc.)

Pre-injection Analyses

Have AF propose their ideas for pre-injection analysis to assess microbiology and geochemistry initial conditions, for comparison to post-injection analyses.

We can propose our own pre-injection analyses to assess microbiology and geochemistry initial conditions, and try to come to a meeting of the minds with AF.

These pre-injection and post-injection tests (for the phased implementation) would form another set of performance criteria; that is, to determine if the appropriate bug populations are developed to proper levels and activity.

Phased Implementation

A phased implementation, applied to a limited area of the site (but all vertical zones) would be the first major milestone (performance criterion) for success; i.e., if the COCs concentrations are lowered to the required concentrations, and stay there, that would be a major step to indicate feasibility of EBR.

A phased implementation could consist of starting EBR at selected sections of the site (i.e., essentially just a portion of what they have already planned for full-scale EBR, so there would not have to be any major changes in terms of approach). That is, pick wells with substantial LNAPL, at least one well in each of the various vertical zones, have injection wells upgradient of the LNAPL wells, and monitoring wells immediately downgradient of the wells, and inject sulfate, etc., as planned for the full-scale EBR. If AF can timely remediate that well so that the COC GW concentrations in those representative wells and the downgradient monitoring wells are (and remain over time) below EBR goals, then that would be strong evidence that a full-scale approach could work.

The chosen LNAPL well should have significant LNAPL — more than a sheen — at least two inches of LNAPL fairly consistently, so that actual remediation of GW in contact with substantial LNAPL can be assessed.

Chosen well should be at elevated temperature, to correspond with the general site conditions.

Reagent injections (sulfate, etc.) should reflect those concentrations, rates, volumes, etc. that are proposed for full-scale EBR.

Assuming the phased implementation continues for at least a year, the changes around the injection wells in terms of microbiology, sulfate concentrations, sulfide production, hydrogen sulfide generation, precipitation of iron sulfides, possible aquifer plugging, changes in pH, etc., can be monitored and evaluated for viability of a full-scale remedy, and any likely dangers, showstoppers, etc.

Fouling should be assessed for all wells (injection, LNAPL, monitoring), to determine the likely needs for well reworking, refurbishing, eventual replacement, etc. This is particularly important for the follow-on contractor (after AMEC's contract expires) to have an idea of long-term costs, and how to bid.

The downgradient monitoring transect can not only monitor COC changes, but also assess the geochemical footprint of downgradient locations, which would be pertinent to evaluating possible enlargement of a sulfate/etc. plume at full scale.

Also, the distribution and concentrations of sulfate achieved downgradient of the injection transect is of great interest. The AF model indicates they can get a reasonable (to them) sulfate distribution, but reality in subsurface environments is often different from the models. The field study should be designed to provide suitable data to design injection well spacing, injection rates, injection concentrations, pressures, etc., so as to achieve useful sulfate concentrations across the site.